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EA SCOPE DOCUMENT
PROGRAM ENVIRONMENTAL ASSESSMENT
ONTARIO HYDRO'S FLUE GAS DESULPHURIZATION
PROGRAM

Environmental Studies & Assessments Department
Report No. 86230 Sept., 1986

Ministry of Environment & Energy
Approval Branch Library

Prepared by:

D.E. Barker

D.E. Barker
Environmental Studies Engineer

Reviewed by:

W.M. Paterson
W.M. Paterson
A/Supervisor - Planning

Approved by:

R.J. Malvern
R.J. Malvern
Section Head
Environmental
Planning & Assessment



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SUMMARY

This document has been prepared to describe Ontario Hydro's approach to meeting Environmental Assessment Act requirements for the flue gas desulphurization (FGD) component of its Acid Gas Control Program.

The purpose of the undertaking (i.e., FGD Program) is to control and reduce acid gas emissions to levels required by Regulation 662/85 under the Environmental Protection Act. Ontario Hydro intends to meet this requirements initially by reducing its sulphur dioxide (SO₂) emissions. This Program is not intended to reduce nitrogen oxide emissions.

Approval will be requested to install up to 20 FGD units, including, initially, as many as four different technologies which may be located at up to three existing coal-fired stations (i.e. Lambton, Nanticoke and Lakeview Generating Stations).

Under this approval, Ontario Hydro seeks the flexibility to:

- (a) regularly readjust program schedules in accordance with FGD technological advances and current emission forecasts;
- (b) revise the sequence of installation and number of FGD units at each station in accordance with system needs and priorities, and;
- (c) identify off-site waste disposal requirements and acquire sites.

This type of flexibility is required to deal with uncertainties in load growth, and the utilization rates of coal-fired generating stations (and their associated emission rates). It also allows Ontario Hydro to take advantage of the latest advances in FGD technology in committing future FGD units.

As specified in Section 5(3) of the EA Act, the Program EA will describe and discuss:

- (a) the major features of the Undertaking (including a discussion of the implementation process for the FGD Program);
- (b) alternatives to the Undertaking (i.e. other ways of reducing acid gas emissions);
- (c) alternative methods of carrying out the Undertaking (with respect to FGD technologies, sites, installation sequence, waste management, other facilities/processes);
- (d) the environment that will be affected (i.e., the local environment surrounding the candidate generating station sites);

- (e) anticipated environmental effects and required mitigation and monitoring requirements, and
- (f) the public and government involvement process.

Given forecast load conditions, the first two FGD units must be in-service by February and April, 1994 respectively. Higher than forecast load conditions may require FGD units to be in-service during 1993. The Program EA document will be submitted to Government in January of 1988. To meet requirements for the forecast load situation, EA Act approval is required by July, 1989. A 1993 in-service will require a special approach to approvals.

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This document has been prepared to describe Ontario Hydro's approach to meeting Environmental Assessment Act requirements for the flue gas desulphurization component of Ontario Hydro's Acid Gas Control Program. The approach selected is based on the advice received from the MOE Environmental Assessment Branch, during a series of meetings in the period November through December 1985 and culminating in their recommendation for an individual (program), rather than a class, EA for all acid gas control facilities to be retrofitted on Hydro's existing coal-fired generating stations.

The proposed Program EA will describe the implementation plan or program for facilities which will be required over a 20-year planning period to satisfy the requirements of Regulation 662/85, under the Environmental Protection Act. In recognition of the high capital and operating costs of the flue gas desulphurization (FGD) facilities, the uncertainty in the rates of acid gas emissions and the developmental status of some promising scrubbing processes, a flexible program is required by Ontario Hydro. Approval will be requested to install up to 20 flue gas desulphurization units, including, initially, as many as four different technologies, and possibly more later, which may be located at up to three existing coal-fired stations (i.e., Lambton, Nanticoke and Lakeview Generating Stations).

The schedule of allowable emissions imposed by the new Regulation 662/85 may present serious time constraints on the EA approval process for control programs under some rates of growth in demand for electricity. Based on Hydro's upper load growth forecast, FGD (or the equivalent in other supply or demand management options) on up to 20 existing fossil units could be necessary by the late 1990s. In the same time period, under forecast load growth, 12 FGD units or equivalent will be required. FGD is not expected to be required for Hydro's lower load growth forecast.

Based on forecast load growth, EA Act approval must be obtained by July, 1989, to allow sufficient time for construction and a limited period of commissioning start-up to ensure that the first units facilities will be fully operational and functioning satisfactorily, allowing compliance with the 1994 emission limits.

If, because of high load growth, installation of FGD units is required before 1994, the EA process proposed will provide the option for a Special EA to address earlier installation of FGD at one specific site. This will require an acceleration of studies and approvals for selected options within the overall program.

Should approval not appear to be forthcoming by the required date, it may be necessary to apply for an exemption for the first units. In this eventuality, a decision on the exemption would have full benefit of a prior EA submission and feedback from the presubmission consultation process.

The proposed EA process includes opportunities for presubmission consultation and public involvement during preparation of the EA. The public involvement efforts will be concentrated in the latter stages of the process, when the program is better defined.

2.0 APPROACH TO EA REQUIREMENTS

The final Program EA document must fulfill the requirements of Section 5(3) of the EA Act. The undertaking will be in the form of a program with specific physical components. It will seek approval for a number of FGD process alternatives and, hence, in respect to the MOE General Guidelines for the Preparation of Environmental Assessments (July 1978), the undertaking will be based on decision-making which will take place both before and after the approval. In both cases, the Program EA will describe these decision-making processes.

To accommodate the uncertainties in load growth, the utilization rate of coal-fired facilities and the associated emission rates, the Program EA can provide only a range of estimates of the number of FGD units required, the time period in which they are required and the sequence of their implementation.

Under this approval, Ontario Hydro seeks the flexibility to:

- (a) regularly readjust program schedules in accordance with FGD technological advances and current emission forecasts;
- (b) revise the sequence of installation and number of FGD units at each station in accordance with system needs and priorities; and
- (c) identify off-site waste disposal requirements and acquire sites.

2.1 Purpose of the Undertaking

The purpose of the undertaking is to control and reduce acid gas emissions to levels required by Regulation 662/85 under the Environmental Protection Act. Ontario Hydro plans to meet this requirement by reducing of sulphur dioxide (SO₂) emissions. This program is not intended to reduce nitrogen oxide (NO_x) emissions. Ontario Hydro has programs underway, not part of this undertaking, to address the NO_x issue.

Although coincident reductions in acid deposition in Ontario and neighbouring areas will result from this undertaking, these reductions are not the purpose of this undertaking.

2.2 Undertaking

The major features of the undertaking include:



- (a) the retrofitting of SO₂ emission control facilities at up to three existing coal-fired stations (i.e., Lambton, Nanticoke and Lakeview);
- (b) reagent handling, processing and storage facilities;
- (c) waste handling and disposal facilities;
- (d) ducting and stack modifications or additions (i.e., for release of 'scrubbed' flue gases);
- (e) the identification of off-site waste disposal sites and property acquisition.

Facilities will be built as required to satisfy Regulation 662/85 within the time period 1989 to 2010. (NOTE: Beyond this period, improvements to emission control facilities will be considered in the context of broader station rehabilitation studies and the associated approval requirements will apply.)

Initial studies of FGD control technology will focus on the following processes:

- (a) limestone slurry process;
- (b) limestone dual alkali process;
- (c) lime spray dryer process;
- (d) furnace injection process.

The opportunity to substitute other process technologies, which may develop in the future, will be sought using methods developed during the presubmission consultation process for the Program EA.

Ontario Hydro will seek approval for all activities relating to the planning, design, construction, operation and maintenance and decommissioning of up to twenty FGD units and associated waste disposal facilities, including any required property acquisition, at up to three sites.

Within the EA, the description of the undertaking will include:

- (a) a schematic process flow diagram for each technology considered, including preliminary mass balances;
- (b) a description of each candidate technology including typical equipment requirements, process chemistry, raw materials, estimated operating efficiency and reliability, capital and operating costs, plus technical advantages and disadvantages;

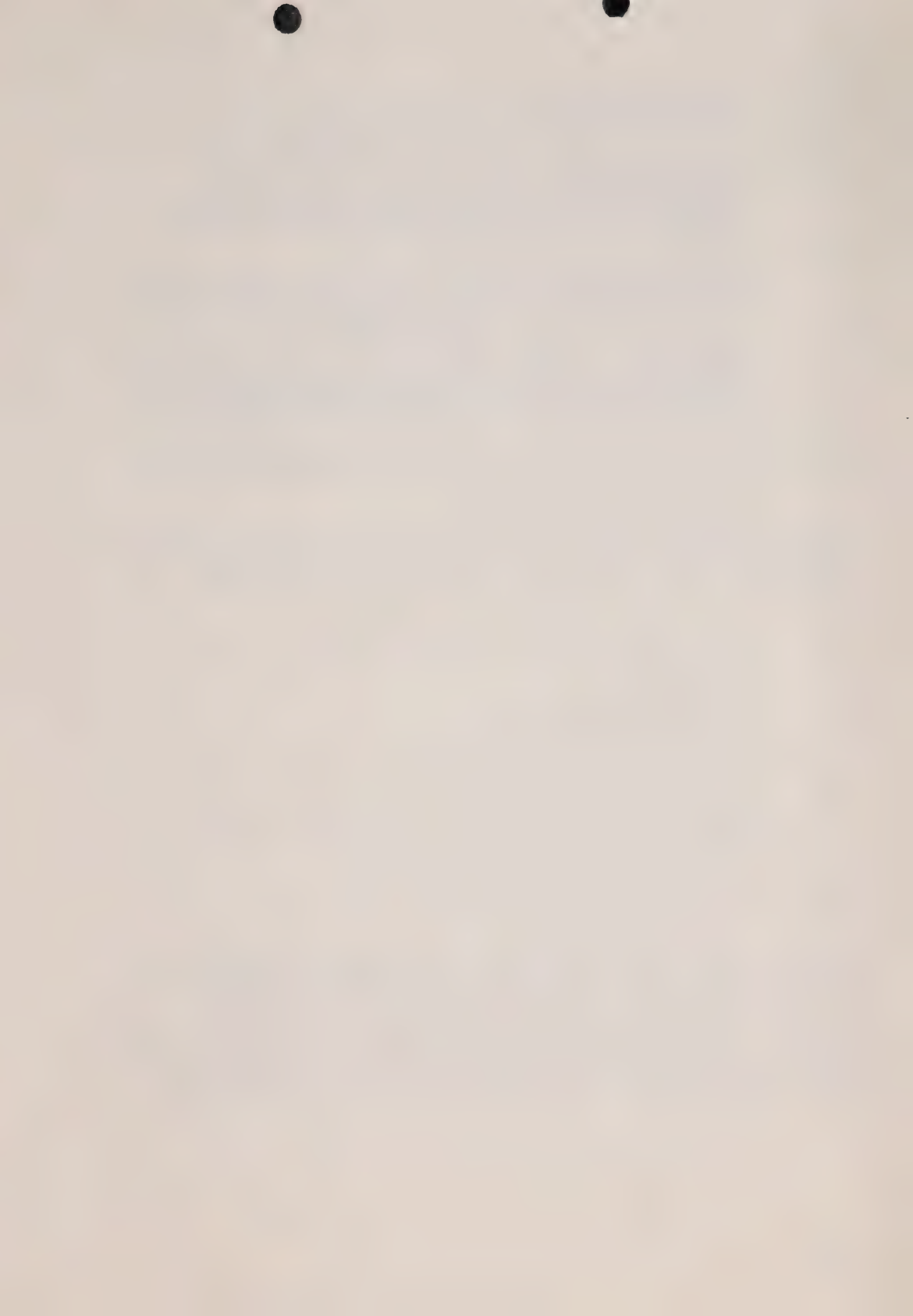
- (c) a description of typical solid waste products, atmospheric emissions and liquid effluents from each process;
- (d) a preliminary layout at each site, for each technology, indicating location of emission control and waste disposal facilities, and identifying differences between the candidate technologies;
- (e) a description of each candidate site including existing natural environmental and socio-economic conditions, expected impacts of the proposed project and mitigative measures;
- (f) a description of typical construction and operating work forces required for the candidate project (including breakdown according to different trades, management and unskilled work categories);
- (g) a typical construction schedule for each candidate technology.

2.3 Alternatives to the Undertaking

Various alternative measures are available to effect a reduction in acid gas emission. The following will be considered in the Program EA document:

- (a) substitution of alternative generation sources:
 - (1) hydroelectric
 - (2) nuclear
 - (3) other fossil fuels
 - (4) new combustion technologies;
- (b) conservation and demand management;
- (c) increased use of low sulphur fuels including coal blending, washing, etc.;
- (d) increased importation of electricity; and
- (e) decreased exportation of electricity.

The alternatives will be described in terms of their current and/or potential role in Hydro's acid gas control program and the implications of early retirement or de-rating of Hydro's existing coal-fired stations. Alternatives will also be discussed in terms of their economic, technical and environmental characteristics. It must be noted that these alternatives are all compatible and not mutually exclusive. Hence, the Program EA will describe the functional limitations of each.



2.4 Alternative Methods of Carrying Out the Undertaking

The Program EA will include a discussion of the alternative methods of carrying out each phase of the undertaking. The types of alternatives which will be considered include:

- (a) alternative sites;
- (b) alternative flue gas desulphurization processes:
 - (1) high efficiency throwaway product processes:
 - lime slurry scrubbing
 - limestone slurry scrubbing (Chiyoda CT-121)
 - lime spray dryer
 - dual alkali;
 - (2) low efficiency throwaway product processes:
 - furnace injection;
 - (3) saleable product processes:
 - Wellman - Lord
 - citrate
 - magnesia
 - limestone slurry-commercial gypsum
- (c) alternative waste disposal concepts:
 - (1) co-disposal with ash (stabilization)
 - (2) chemical fixation
 - (3) oxidation and gypsum stacking
 - (4) waste materials sales;
- (d) waste disposal sites:
 - (1) on-site
 - (2) adjacent property (contiguous)
 - (3) off-site (remote);
- (e) sequence of installations;
- (f) flue gas reheat;
- (g) closed cycle or effluent free systems; and
- (h) stack modifications/additions.

In each case, a formal comparison and selection of alternatives may not be possible. For example, it is anticipated that off-site waste disposal will be necessary at Lakeview GS. Ash is currently hauled from Lakeview for sale or to a private, off-site, landfill. Because of the uncertainty in timing and disposal requirements for a Lakeview GS FGD system, it is proposed that the Program EA describe the possible waste disposal alternatives and the process that will be undertaken to select an acceptable disposal site. If the selected site has not previously been approved for this type of waste, Ontario Hydro will make application under the applicable legislation.

A similar procedure will be described for Lambton and Nanticoke GS wastes. In this case, however, haulage to a remote site is not anticipated. Some on-site waste disposal capacity does exist. Over the life of the facility, purchase of adjacent property for expansion of facilities is expected. Accordingly, the Program EA will describe waste disposal alternatives available at each site, and the necessary site selection and approval procedures to be undertaken.

This approach, of describing future decision-making procedures and including them within a single EA Act approval, was successfully applied by the Bruce Energy Centre EA and is a typical feature of Class EA approvals.

2.5 The Environment that will be Affected

The Program EA will include a description of that environment which will be affected, or might reasonably be affected, in the vicinity of the Lambton, Nanticoke and Lakeview GS sites. The geographical limits of the description will vary with type and extent of changes which may occur. A discussion of the natural environment will largely be restricted to the immediate vicinity of each site, including; local air quality, water quality and soils considerations associated with impingement of stack emissions, release of treated effluents and groundwater contaminant migration. Off-site areas considered for waste disposal will extend the area which could be impacted and any areas thus identified will be discussed.

A discussion of the socio-economic environment will consider all neighbouring communities likely to be impacted by construction and operating work forces, service requirements, etc.

The following is a listing of the environmental components which will be described:



(a) Terrestrial Environment

- | | |
|-------------------------|---------------------------------|
| (1) vegetation | (on-site and any areas off-site |
| (2) wildlife | which may be affected) |
| (3) physical topography | |
| (4) subsurface geology | |

(b) Aquatic Environment

- | | |
|---------------------------|---------------------------------|
| (1) water quality | (on-site and any off-site areas |
| (2) groundwater hydrology | which may be affected) |

(c) Atmospheric Environment

- | | |
|---|--|
| (1) air quality (including noise, dust and waste hauling) | (on-site and any off-site areas which may be affected) |
| (2) climate | |

(d) Resource Use

- | | |
|--|--|
| (1) land use | (maximum 5 km radius or area required to include off-site waste disposal area) |
| (2) aquatic resource use:
- surface water
- ground water | (maximum 5 km radius or area required to include off-site waste disposal area) |
| (3) heritage | (only for areas previously undisturbed) |

(e) Socioeconomic Environment

- | |
|----------------------------------|
| (1) demographics & labour supply |
| (2) economic base |
| (3) municipal & regional |
| (4) services |
| (5) municipal finance |
| (6) social and cultural patterns |

2.6 Anticipated Environmental Effects

An EA is required to include a description of "the effects that will be caused or that might reasonably be expected to be caused to the environment" by the undertaking and alternative methods of carrying out the undertaking. The uncertainty in the number of units to be installed, the sequencing of units, the FGD processes etc., would complicate an individual EA because of the broad range of potential effects. The approach that is proposed will include an overview of the possible changes to the existing environment at each site for both the

construction and operation phases. The Program EA will attempt to address the range of possible effects including 'worst case' scenarios, but may not be able to anticipate all eventualities.

Hydro proposes to limit emissions from each station in accordance with applicable air and water quality criteria and solid waste disposal requirements established under the Environmental Protection Act, Ontario Water Resources Act, etc. and any other applicable legislation.

Recognizing that subsequent approvals must be obtained under other statutes (e.g. EP Act etc.), at a time when decisions have been made in respect to the actual emission control facilities, waste disposal facilities, construction schedules, etc., at each site, the Program EA will emphasize the generic effects associated with the process technologies and qualitative assessments of site-specific effects.

Examples of possible areas of change to the existing environment are summarized below:

(a) Atmospheric Environment

- (1) increased noise during construction and operation;
- (2) fugitive dust emissions during construction and operation;
- (3) increased fog formation and icing;
- (4) organo-sulphur emission from disposal areas;
- (5) reduced plume buoyancy and associated local air quality effects;
- (6) more visible plume from stack;
- (7) acid rain-out from stack.

(b) Aquatic Environment

- (1) increased station evaporative losses (i.e. consumptive water use);
- (2) small increases in chloride, sulphate and sulphite in station cooling water discharges;
- (3) localized contamination of surface runoff.

(c) Terrestrial Environment

- (1) limited disturbance to vegetation and wildlife;
- (2) possible localized groundwater contamination effects.



(d) Socio-Economic Effects

- (1) aesthetic changes to site;
- (2) increased employment opportunities;
- (3) increased vehicle/train traffic and associated effects;
- (4) increased demand on municipal and regional services.

(e) Resource Use

- (1) increased commitment of land for waste disposal and associated effects on existing uses.

2.7 Mitigation and Monitoring

The Program EA will describe typical mitigative measures which will be employed at each station to lessen the impacts of each development, during both construction and operating phases. In addition, a description of proposed monitoring programs will also be provided. The objective of these programs is to assess actual impacts of each development and to assess the need for post-development design or operational improvements (i.e. as part of a broader environmental management program).

Figure 1 is a schematic representation of the process which will be followed in preparing the Program EA and obtaining approval.

3.0 EA PROCESS

The previous section has described a document which combines some of the features of an individual or project EA and a class EA. This is necessary because of the large uncertainty in the ultimate size, location and technology of the FGD program to be implemented by Ontario Hydro.

It is Hydro's objective to satisfy EA Act requirements, within one formal Program EA submission. To achieve this end, consultation will be undertaken with government reviewers regarding:

- (1) the respective concerns of the various Ministries including study requirements, anticipated effects and mitigation requirements;
- (2) future decision-making procedures to be described in the Program EA;
- (3) future approval requirements under other legislation;
- (4) procedures for changes to the project description;
- (5) Program EA follow-up and monitoring requirements;
- (6) development controls or commitments not included above (e.g. compliance with construction guidelines etc.); and

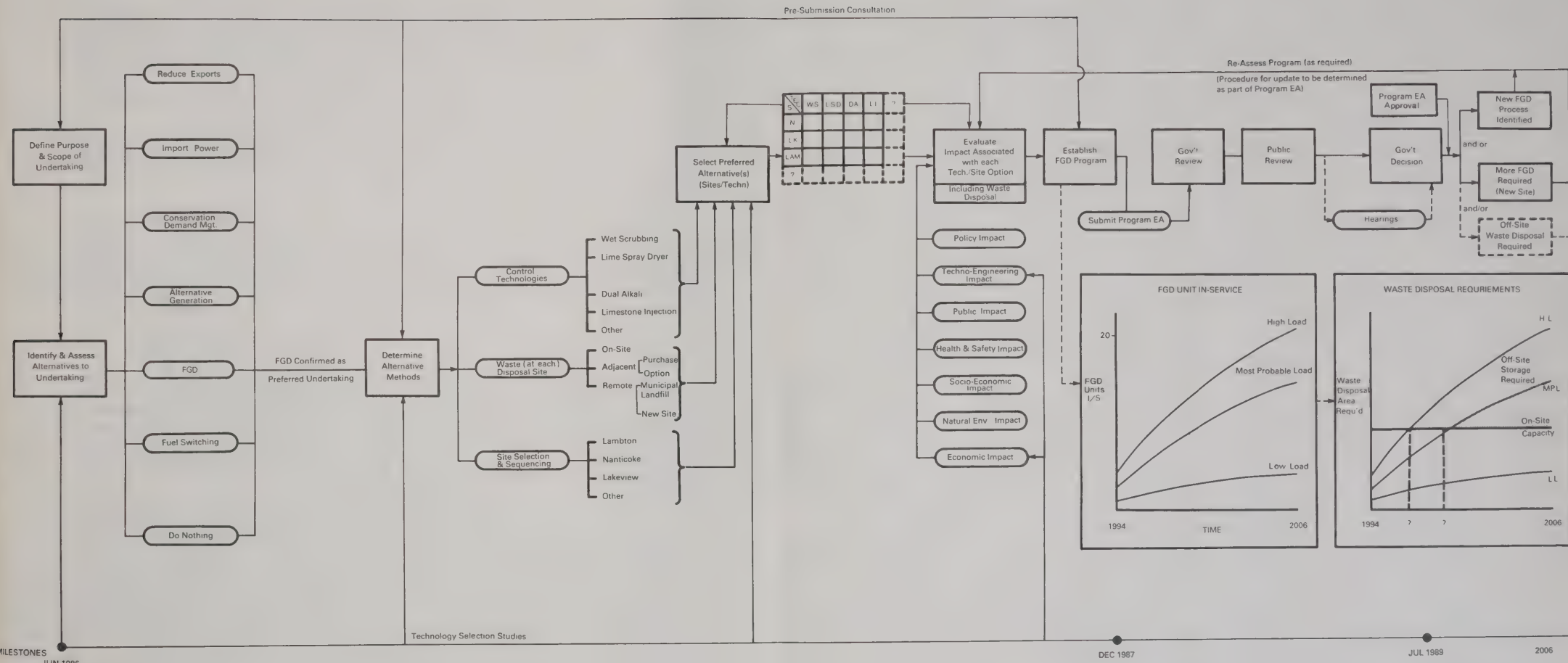
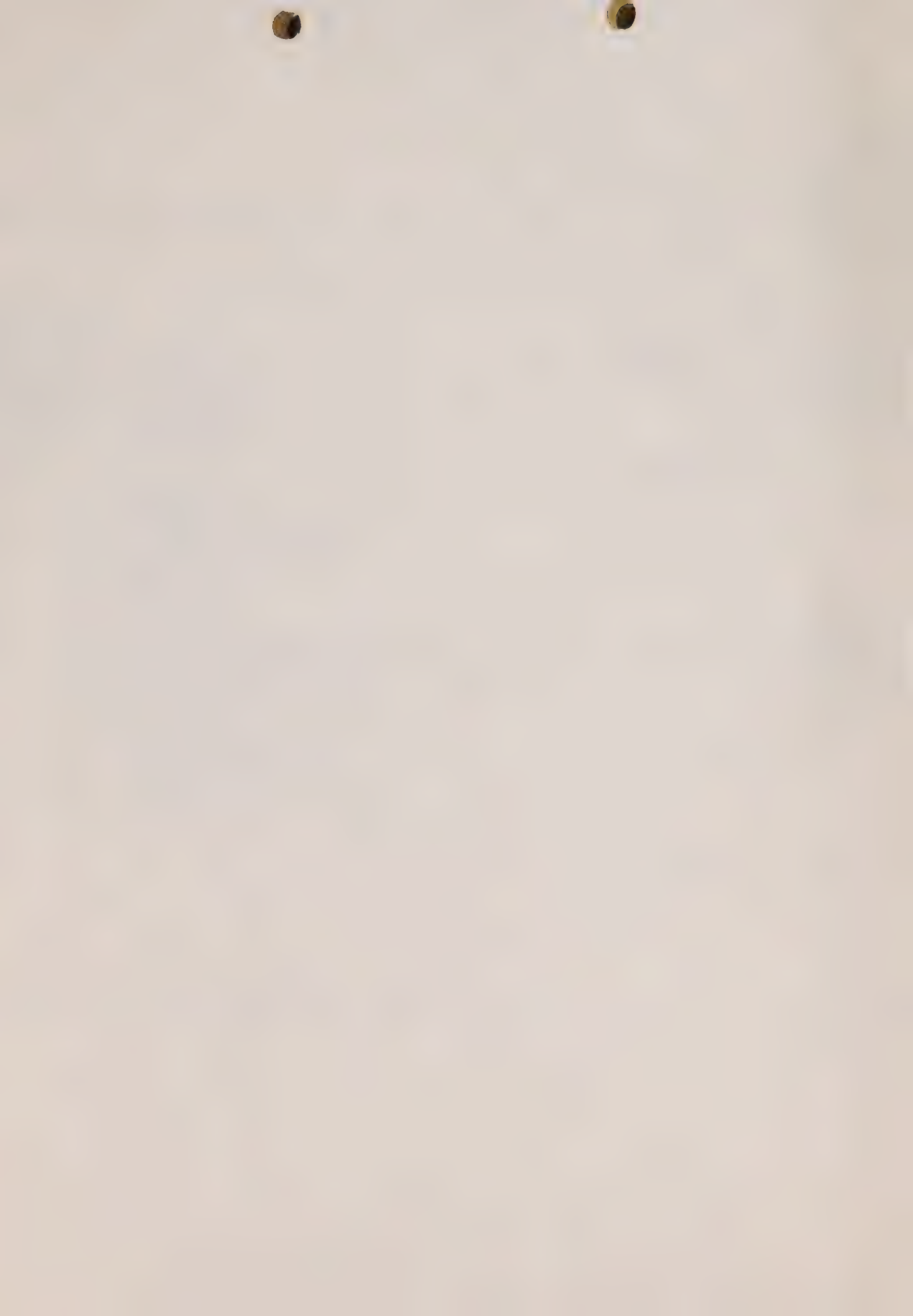


FIGURE 1
FGD Program EA
Flow Diagram of EA Process



(7) general Program EA documentation requirements.

As previously mentioned, if, within the course of the Program EA preparation and approval process, site-specific approval is not forthcoming at a time when compliance with Regulation 662/85 is jeopardized, an exemption application may be prepared. The details and documentation requirements associated with the exemption application will be developed jointly with the MOE and any interested government reviewers.

An EA process logic diagram is presented in Figure 2, for reference.

The EA will be co-ordinated and undertaken by Ontario Hydro staff. Responsibility for co-ordination of the document rests with Environmental Studies and Assessments Department, Design and Development - Generation Division.

3.1 Process Schedule

A scheduled December, 1987 date for Hydro Board approval to submit the EA documentation to government in January, 1988 and government approval under the EA Act by July, 1989 are required to satisfy the planned first unit In-Service date of early to mid-1994. The current proposed schedule is shown in Figure 3.

3.2 Public Information Program

A public information program is proposed as part of the EA process. The purpose is to notify the public that work has been initiated to obtain the necessary environmental approvals to ensure compliance with Regulation 662/85 and to provide background information on the need for emission controls, the complete acid gas control program, the alternatives being considered, potential environmental effects and mitigation measures which are under consideration.

The uncertainty associated with the emission control program (i.e., number of units required, I/S dates, FGD technologies and number of sites to be affected) presents a unique situation, different from most EA processes. Commitments will be made in the Program EA to provide opportunities for public involvement when site-specific decisions are made, and there is greater certainty as to the impacts that a given community may encounter. The emphasis of the public involvement program for this EA will be on the provision of information and opportunity for input on a local basis in the vicinity of each of the potential sites.

The information program will likely be based on:

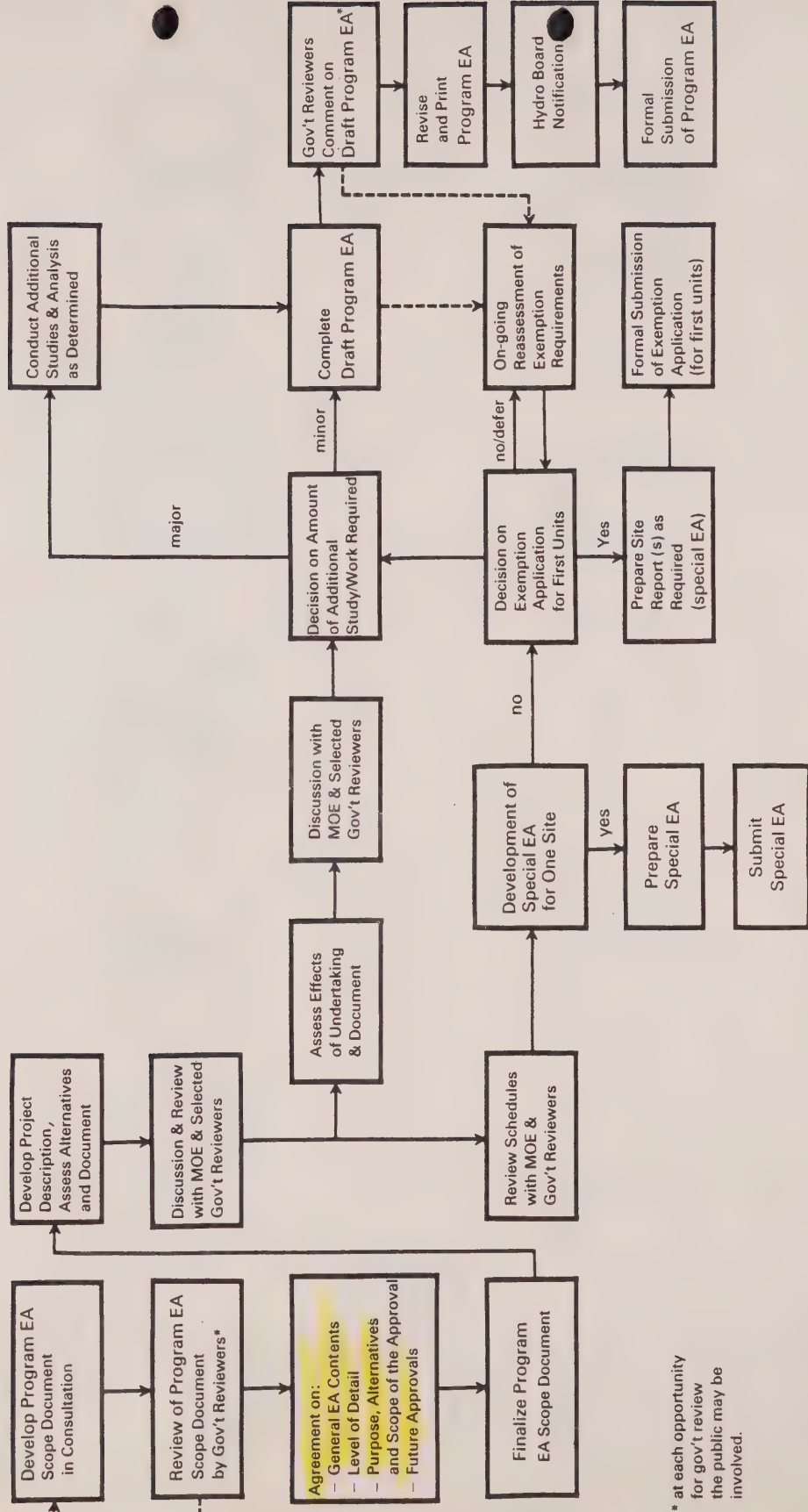
- (1) information releases (brochures, press releases as appropriate) describing Hydro's acid gas control program and EA Act approval process (objectives, scope and schedule);

- (2) Communications program and liaison with citizen's groups, periodic presentations, media reports and establishment of a public information centre prior to construction.

3.3 Presubmission Consultation

Various government agencies are being contacted by way of this document and consultation will continue at intervals throughout the Program EA development. The agencies will be given the opportunity to express concerns about the proposal, provide input to, or influence, the final document. Each agency will have the opportunity to review the completed Program EA.

A copy of the proposed Table of Contents for the Program EA is included in Appendix I.



* at each opportunity for gov't review the public may be involved.

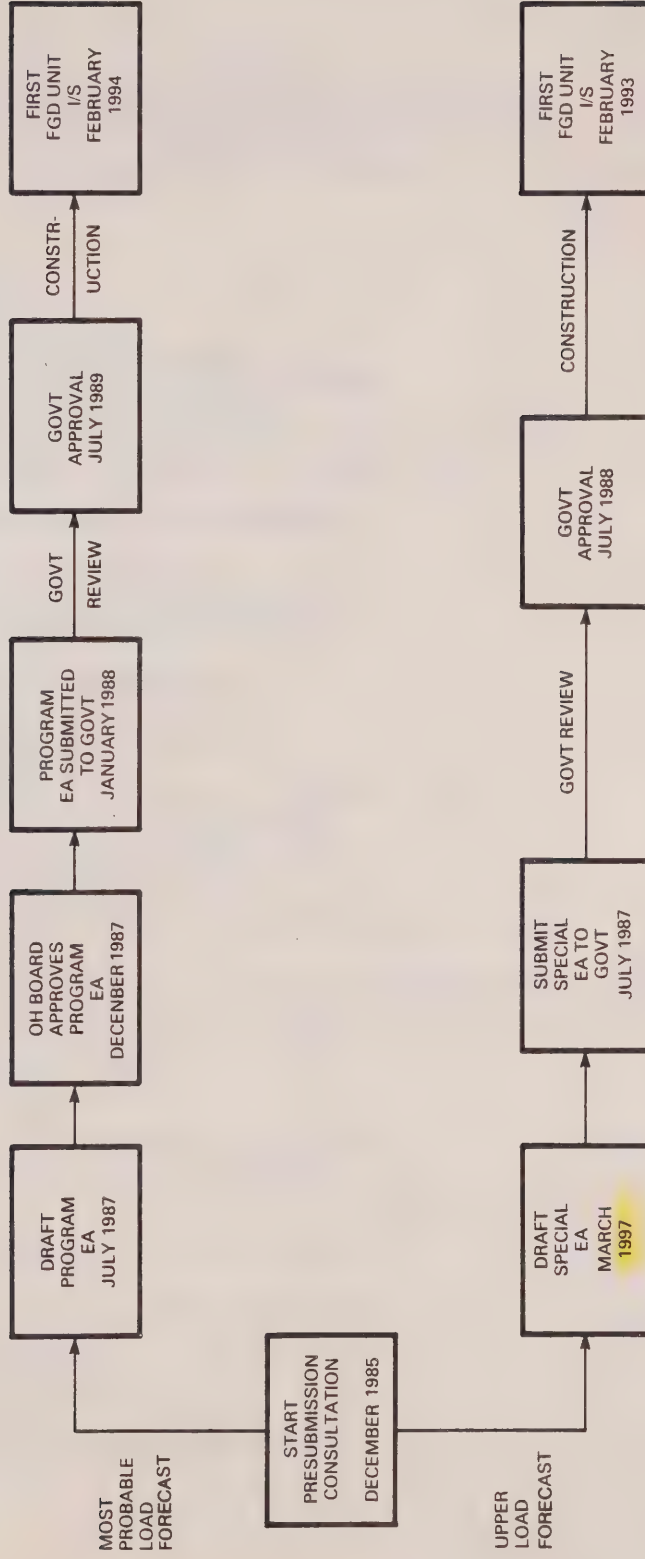
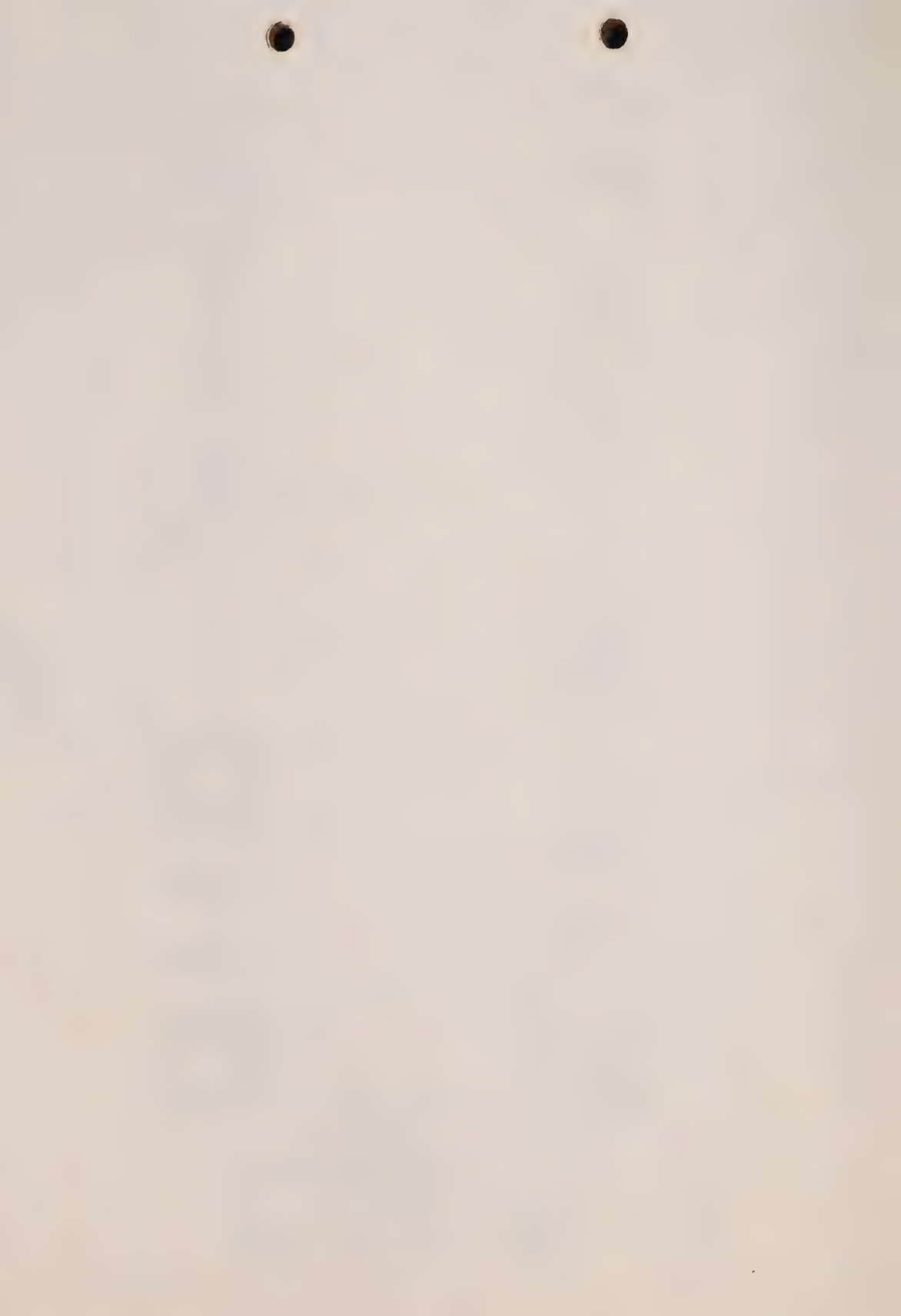


FIGURE 3
FGD SCHEDULE



APPENDIX I

PROGRAM ENVIRONMENTAL ASSESSMENT
ONTARIO HYDRO'S FLUE GAS DESULPHURIZATION
PROGRAM

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- Economic Base
- Regional and Municipal Services
- Public Administration
- Social Fabric

7.2.2.2 Operation

- Demographics
- Labour Supply
- Economic Base
- Regional and Municipal Services
- Public Administration
- Social Fabric

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